PRELIMINARY RESULTS OF THE MARCH 1983 SAMPLE OF BARREN-GROUND CARIBOU FROM THE BEVERLY HERD

by

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SUMMARY

The status of the Beverly Herd of barren-ground caribou in March 1983 was assessed by examining physical characters and fat reserves of 158 specimens obtained in the Tent Lake region of the N.W.T. Body weights and fat reserves were similar to those measured in samples obtained from the herd in November 1982, except that fat deposits around the kidneys had increased. Condition indices were lower than one year earlier in all sex and age classes except for males over two years old. Comparisons with data from March 1980-82 indicate lowered fat reserves each year after 1981. The level of condition in March 1983 was higher than found in March 1980, when caribou wintered further south than usual for the last decade. The herd wintered near the tundra in 1982-83 and made on excursion onto the tundra in December and January. Pregnancy rates in females aged three, four and greater than four years were 60, 57 and 83%, respectively. Those rates are all lower than one year earlier and suggest that fertility is related to physical condition.

INTRODUCTION

A four year study of the impact of fire on the Beverly Herd of barren-ground caribou (Rangifer tarandus groenlandicus) was started in the winter of 1982-83. A major objective of the study was to assess the adequacy of the present winter range for the herd. The best indicator of the quality of the winter range is the performance of the caribou using that range during the winter. Performance is measured in terms of changes in fat reserves during the winter. We expected that subadults and adult females would lose fat over winter and adult males would gain some fat from November to March, based on the results of a 1966-68 study of the

adjacent Kaminuriak Herd (Dauphiné 1976). The winter range of that herd was burned at a low annual rate of only 0.2% in the period 1955 to 1967 (Miller 1976). The rate was over four-fold lower than the rate of 0.96% calculated for the period 1966 to 1982 on the winter range of the Beverly Herd (Ferguson 1983).

In November 1982, a sample of 75 caribou was obtained from the Beverly Herd as it passed Porter Lake. The conclusion, after preliminary analysis of some of the measurements of condition, was that herd members were in relatively poor physical condition for that period of the annual cycle (Thomas et al. 1983). This report outlines the results of the preliminary analysis of the data from the March 1983 sample of caribou obtained east of Tent Lake.

METHODS

The distribution and movements of the Beverly Herd was monitored monthly from October 1982 to February 1983. On March 7, 8, 10 and 11 the distribution and movement pattern of the herd was recorded by flying transects over the winter range in the NWT. On the 11 March, the densest concentration of caribou was at "tree line" in the Tent Lake region. A survey on 16 March showed that the concentration was on the tundra in the Catholic Lake region 32 km (20 mi) east-northeast of Tent Lake. Camp was established that date by DC3 and Cessna 185 aircraft at 62°32'N, 107°34'W on a lake between Tent and Catholic lakes.

From 17-21 March, 150 caribou were obtained by use of snowmobiles. Some data was obtained from another eight caribou taken on 22 March by the Fort Smith Hunters and Trappers Association. Blood samples were obtained from most of the caribou shortly after death. The intact animals were

hauled to the camp where they were weighed and necropsied. Data obtained in the field included weight, girth, maximum fat depths forward and lateral to the base of the tail, and numbers of warble fly larvae on the hide. Samples taken included the kidneys and fat (weighed in Fort Smith) around them, forage in the rumen, antlers, bones of the right hind leg, fetuses and jaws. Ages were estimated in the field by the eruption pattern and degree of wear of the teeth. These were checked in the laboratory and this report is based on those ages. The results will change slightly after the ages are estimated more accurately from the numbers of growth rings in incisors and molars.

RESULTS

1. Composition of the sample (Table 1).

The structure of the sample reflects a bias against shooting calves, because of their small size and thinness, and a scarcity of males over three years old at the collection site. The apparent over representation of 2-and 3-year-old males suggests they were selected, although 2-year-old males are similar in appearance to adult females. Fewer males would be present in the main concentration of caribou at the head of the movement.

2. Condition indices (Table 2).

Weight increased progressively with age in males and females, except that females aged three and four years were the same weight. In older females, the increased weight with age is influenced by their higher pregnancy rates because the fetus, placenta and fluids contribute several pounds.

Average back fat depths were under 2 mm in all ages of males and females one and two years old. They were higher in females aged three and five years than in females 6-11 years old, which is unusual.

Kidney fat weights and the kidney fat indices increased with age in females and males but stabilized at age five and four, respectively. Both indices were higher in females than males, except in calves.

Numbers of warble-fly larvae may be related to condition but other factors such as differences in the timing of migration among sex and age classes and fly avoidance behavior probably are the greatest factors in the incidence of the parasite. The highest incidences were in the first two age-classes (both sexes) and in males five years old.

3. Relative condition of the Beverly Herd in March 1983.

Weights of all sex and age classes were lower in March 1983 than in March 1982 (Table 3). They were similar to body weights in the November 1982 sample, some being higher and others lower.

Average depths of back fat were generally lower in March 1983 than in March 1982 (Table 4). The difference was most pronounced in females over three years old: 17 mm in 1982 compared with 9 mm in 1983. Back fat depths in March 1983 were similar to those of November 1982.

The average weight of kidney fat in March 1983 was lower than one year earlier in all age classes of females and in males one to three years old, where sample sizes were adequate. The opposite was true for older males (Table 5). Where sample sizes were adequate, there was generally more fat around the kidneys in March 1982, than in November 1982 (Table 5). This difference was significant in females over three years old: 87 g in March compared with 72 g in November.

Kidney fat indices generally were lower in March 1983 than in March 1982; significantly lower in females over three years old. The inference is that kidney weight changed between years in females four and five years old and this will be examined in a later report. With the exception of females two years old, the indices were higher in March than in November. However, this must be examined in light of possible changes in kidney weight.

Data on condition indices of females over three years of age each March since 1980 indicate generally a progressive decline in condition since 1981 (Table 7). The 1983 level was slightly higher than in 1980, if weight is ignored. It is influenced by the higher pregnancy rate in the 1980 sample.

4. Pregnancy rates (Table 8).

Pregnancy rates in females aged three, four and older than four years were 60, 57 and 83%, respectively. Those rates are all lower than one year earlier and suggest that fertility is linked to physical condition. One fetus weighed only 9.2 grams compared with an average over 1200 g for all other fetuses. It was estimated to have been conceived in January, rather than the usual time of late-October.

DISCUSSION

The sample obviously is overloaded with males two and three years old, and deficient in calves and males over five years old. There was selection against calves but otherwise the samples probably were representative of the caribou in the area during the six-day collection period. A delay of four days in establishing the camp, caused by bad

weather, prevented sampling from the main concentration near the head of the movement.

On 11 March, the large aggregations containing up to 3000 caribou were between Tent Lake and the lake selected as a camp site. By 16 March, the concentration had moved 26 km (16 mi) to Catholic Lake; 19 km (12 mi) from the camp lake. They had moved onto the tundra where lack of cover and hard drifts prevented establishment of a camp near the front of the migration, which proceeded in a northeasterly direction. In a typical spring migration, the adult cows and calves constitute the bulk of the caribou at the head of the movement. Young bulls are proportionately most numerous in the mid regions of the distribution and fully mature males constitute the bulk of animals near the tail of the migration. In early May, the older males were migrating northward but they still occupied, on a north-south axis, most of the winter range in the NWT. They extended from 60°N to tree line. These results illustrate the problem of obtaining samples representative of the caribou herd because caribou are segregated to varying degrees at all times of the year. Still, they suggest that survival of young caribou was relatively high over the past five years.

The Beverly Herd maintained, through the major portion of the winter, the relatively low fat reserves found in November 1982. In fact, fat reserves around the kidneys increased from mid-November to mid-March. A decline in condition over-winter of all classes except adult males was expected from the results of studies done in 1966-68 on the Kaminuriak Herd. Caribou in relatively poor condition in the autumn apparently compensate for it by increasing their food quantity or quality over the winter period. This hypothesis is difficult to prove. Adjustments in food quality should be reflected by the composition of plant fragments in

rumen contents and fecal pellets. Adjustments in forage quanity (intake) may be reflected by weight of rumen contents and proportion of time spent feeding during the winter.

The "main herd" spent the entire winter period, between the November and March collections, near or on the tundra in the region between Penylan Lake and the Reliance-Snowdrift area of Great Slave Lake. One foray was made onto the tundra in the Whitefish-Lynx Lakes region in December and early-January. The tentative conclusion is that feeding conditions were better on the tundra and in the vicinity of "treeline" (outer fringe of the Transitional Forest Zone) than deeper in the forested region. The quantity or quality of the forage may not have been better on or near the tundra but accessibility was easier. The amount of energy used in obtaining forage is an important consideration.

The progressive decline in physical condition from March 1981 to March 1983 suggests that condition in barren-ground caribou may cycle (increase or decrease) over multi-year periods, as it does in Peary caribou. The rapid increase in condition level from March 1980 to March 1981 shows that recovery of fat reserves can be rapid under conditions favorable to the caribou in the spring, summer and autumn.

The data from collections in March 1982 and 1983 suggest that pregnancy rate is affected by the physical condition (expressed by fat reserves) of the females during the rut in late October and early November. The literature on barren-ground caribou states that pregnancy rates are relatively stable. This view must be questioned. It is one variable that is entered in the formula used to estimate the population size of caribou herds from counts of caribou on calving grounds. A better

knowledge of age structure and age-specific pregnancy rates of the populations would improve the estimates of numbers.

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Table 1. Composition of the March 1983 sample of barren-ground caribou obtained east of Tent Lake, NWT.

Age (yr)[a]	Females	Males	Both	% of Total
1	5	2	7	4.5
2	15	22	37	23.6
3	10	20	30	19.1
4	23	8	31	19.7
5	17	4	21	13.3
6-11	29	0	29	18.5
>11	2	0	2	1.3
Totals	101	56	157[b]	100.0

[a]To nearest year and based on degree of tooth wear.
[b]Jaw not obtained from one male two or three years old.

Table 2. Statistics (mean ± SE, N)[a] for the March 1983 sample of barren-ground caribou obtained east of the Tent Lake, NWT.

Sex/Age (yr)[b]		Weight		Back fat	Kidney fat		No. warble
		Pounds	kg	depth (mm)	Weight	Index	fly larvae
Female	1	90 ± 3 (5)	41 ± 1 (5)	0.3 ± 0.3 (4)	20 ± 5 (5)	23 ± 6 (5)	120 ± 25 (4)
Male	1	97 ± 4 (2)	44 ± 2 (2)	1.0 ± 1.0 (2)	26 ± 11 (2)	26 ± 10 (2)	118 ± 8 (2)
Female	2	127 ± 2 (15)	58 ± 1 (15)	1.9 ± 0.5 (15)	47 ± 3 (15)	38 ± 2 (15)	145 ± 26 (14)
Male	2	140 ± 3 (22)	64 ± 1 (22)	1.2 ± 0.4 (22)	40 ± 3 (22)	27 ± 2 (22)	199 ± 35 (20)
Female	3	163 ± 4 (10)	74 ± 2 (10)	11.5 ± 3.0 (10)	83 ± 11 (10)	58 ± 8 (10)	42 ± 8 (9)
Male	3	181 ± 4 (20)	82 ± 2 (20)	0.6 ± 0.2 (18)	51 ± 4 (20)	28 ± 2 (20)	88 ± 19 (20)
Female	4	163 ± 4 (23)	74 ± 2 (23)	8.7 ± 1.9 (23)	81 ± 10 (23)	56 ± 7 (23)	77 ± 14 (22)
Male	4	204 ± 5 (7)	93 ± 2 (7)	0.3 ± 1.6 (8)	60 ± 3 (8)	33 ± 3 (8)	87 ± 18 (7)
Female	5	176 ± 4 (17)	80 ± 2 (17)	12.9 ± 2.1 (18)	98 ± 12 (16)	61 ± 7 (16)	38 ± 6 (16)
Male	5	228 ± 12 (4)	104 ± 6 (4)	1.5 ± 0.9 (4)	63 ± 11 (4)	30 ± 5 (4)	150 ± 95 (4)
Female	6-11	180 ± 3 (29)	82 ± 1 (29)	7.5 ± 1.3 (29)	89 ± 5 (28)	54 ± 3 (28)	56 ± 13 (27)
Female	>11	182 ± 12 (2)	83 ± 6 (2)	8.5 ± 6.5 (2)	36 ± 10 (2)	21 ± 5 (2)	42 ± 5 (2)

[a]Mean = average; SE is standard error, an index of how good the mean is (the smaller, the better); N = sample size = number of specimens in that group.

[b]Age at next birthday based on degree of tooth wear.

Table 3. Weights (mean ± SE (lbs), N) of barren-ground caribou collected on the winter range of the Beverly Herd in March 1982 and 1983 and November 1982.

Sex/age[a]	March 1982	November 1932	March 1983
Female 1	94 ± 2 (13)		90 ± 3 (5)
Male 1	110 ± 3 (7)	93 ± 5 (5)	97 ± 4 (2)
Female 2	131 ± 4 (13)	134 ± 6 (8)	127 ± 2 (15)
Male 2	147 ± 5 (12)	145 ± 7 (7)	140 ± 3 (22)
Female 3	167 ± 8 (4)	155 ± 2 (3)	163 ± 4 (10)
Male 3	190 ± 4 (19)	186 ± 9 (4)	181 ± 4 (20)
Female 4	169 ± 5 (8)	175 ± 7 (2)	163 ± 4 (23)
Male 4	191 ± 6 (7)	207 ± 7 (9)	204 ± 5 (7)
Female 5	189 ± 5 (8)	176 ± 4 (8)	176 ± 4 (17)
Male 5	216 ± 10 (2)	187 ± 14 (3)	228 ± 12 (4)
Female 6-11	185 ± 3 (29)	180 ± 4 (18)	180 ± 3 (29)
Male 6-11		255 (1)	
Female > 11	191 ± 4 (10)	176 ± 5 (3)	182 ± 12 (2)
Female > 3	184 ± 2 (55)	178 ± 3 (31)	174 ± 2 (71)
Male > 3	197 ± 3 (9)		212 ± 6 (11)

[a]Age at next birthday estimated from degree of tooth wear.

Table 4. Depth (mean ± SE (mm), N) of back fat on barren-ground caribou collected from the Beverly Herd in March 1982 and 1983 and November 1982.

Sex/age[a]	March 1982	November 1982	March 1983
Female 1	1.2 ± 0.4 (13)		0.3 ± 0.3 (4)
Male 1	0.4 ± 0.2 (7)	0.5 ± 0.3 (4)	1.0 ± 1.0 (2)
Female 2	2.8 ± 0.9 (12)	5.0 ± 1.6 (8)	1.9 ± 0.5 (15)
Male 2	1.3 ± 0.5 (11)	0.3 ± 0.2 (6)	1.2 ± 0.4 (22)
Female 3	15.0 ± 9.1 (3)	1.7 ± 0.3 (3)	11.5 ± 3.0 (10)
Male 3	1.3 ± 0.3 (18)	0.5 ± 0.1 (4)	0.6 ± 0.2 (18)
Female 4	12.3 ± 5.5 (4)	21 (1)	8.7 ± 1.9 (23)
Male 4	0.6 ± 0.3 (7)	0.2 ± 0.2 (10)	0.3 ± 1.6 (8)
Female 5	26.4 ± 4.0 (7)	9.0 ± 3.3 (9)	12.9 ± 2.1 (18)
Male 5	0 (1)	8.0 ± 5.0 (3)	1.5 ± 0.9 (4)
Female 6-11	14.5 ± 1.6 (28)	9.4 ± 2.2 (19)	7.5 ± 1.3 (29)
Female > 11	18.4 ± 3.7 (10)	0.5 ± 0.5 (2)	8.5 ± 6.5 (2)
Females > 3	16.8 ± 1.5 (49)	9.6 ± 1.7 (31)	9.2 ± 1.0 (72)
Males > 3	1.3 ± 0.6 (10)	1.9 ± 1.3 (14)	0.7 ± 0.3 (12)

[a]Age at next birthday based on degree of tooth wear.

Table 5. Weight (mean ± SE (g), N) of kidney fat of barren-ground caribou collected on the winter range of the Beverly Herd in March 1982 and 1983 and November 1982.

Sex/age[a]	March 1982	November 1982	March 1983
Female 1	29 ± 4 (9)		20 ± 5 (5)
Male 1	32 ± 3 (8)	26 ± 4 (4)	26 ± 11 (2)
Female 2	48 ± 5 (9)	56 ± 11 (7)	47 ± 3 (15)
Male 2	57 ± 4 (9)	32 ± 3 (6)	40 ± 3 (22)
Female 3	83 ± 23 (3)	77 ± 10 (3)	83 ± 11 (10)
Male 3	61 ± 5 (19)	32 ± 4 (4)	51 ± 4 (20)
Female 4	89 ± 9 (7)	89 ± 23 (2)	81 ± 10 (23)
Male 4	41 ± 8 (6)	36 ± 2 (9)	60 ± 3 (8)
Female 5	120 ± 13 (7)	69 ± 10 (9)	98 ± 12 (16)
Male 5	50 ± 5 (2)	61 ± 15 (3)	63 ± 11 (4)
Female 6-11	97 ± 5 (40)	68 ± 6 (19)	89 ± 5 (28)
Female >11	104 ± 8 (12)	69 ± 15 (3)	36 ± 10 (2)
Females >3	99 ± 4 (52)	72 ± 4 (32)	87 ± 5 (69)
Males >3	47 ± 6 (9)	38 ± 3 (11)	61 ± 4 (12)

[a]Age at next birthday based on degree of tooth wear.

Table 6. Kidney fat indices[a] (mean ± SE, N) of barren-ground caribou collected on the winter range of the Beverly Herd in March 1982 and 1983 and November 1982.

Sex/age	March 1982	November 1982	March 1983
Female 1	33 ± 5 (9)		23 ± 6 (5)
Male 1	28 ± 2 (7)	24 ± 3 (4)	26 ± 10 (2)
Female 2	37 ± 4 (9)	45 ± 10 (7)	38 ± 2 (15)
Male 2	39 ± 3 (9)	21 ± 3 (6)	27 ± 2 (22)
Female 3	73 ± 13 (3)	49 ± 6 (3)	58 ± 8 (10)
Male 3	35 ± 3 (17)	20 ± 2 (4)	28 ± 2 (20)
Female 4	60 ± 6 (7)	54 ± 11 (2)	56 ± 7 (23)
Male 4	42 ± 14 (5)	17 ± 1 (9)	33 ± 3 (8)
Female 5	77 ± 7 (7)	45 ± 4 (10)	61 ± 7 (16)
Male 5	21 (1)	13 (1)	30 ± 5 (4)
Female 6-11	59 ± 4 (28)	40 ± 3 (19)	54 ± 3 (28)
Female >11	56 ± 4 (9)	21 (1)	21 ± 5 (2)
Females >3	61 ± 3 (51)	43 ± 2 (34)	55 ± 3 (69)
Males >3	39 ± 12 (6)	17 ± 1 (11)	32 ± 2 (12)

[a]100 x weight fat/weight kidneys.

Table 7. Condition indices (means + SE, N) of female caribou over three years of age in the Beverly Herd in March 1980–1983.

Month/Year	Body weight		Back fat	Kidney fat	
	Kilograms	Pounds	depth (mm)	Weight (g)	Index
March 1980	80 ± 2 (13)	178 ± 4 (13)	4 ± 1 (14)	72 ± 4 (13)	47 ± 2 (13)
March 1981	84 ± 2 (5)	186 ± 6 (5)	20 ± 2 (12)	117 ± 10 (2)	77 ± 8 (12)
March 1982[a]	84 ± 1 (55)	184 ± 2 (55)	17 ± 1 (49)	99 ± 4 (52)	61 ± 3 (51)
March 1983[a]	79 ± 1 (71)	174 ± 2 (71)	9 ± 1 (72)	87 ± 5 (69)	55 ± 3 (69)

[a]Data for 1982 and 1983 subject to change after ages are checked by the dental annulation method.

Table 8. Age-specific pregnancy rates (%) for barren-ground caribou collected from the Beverly Herd in March 1982 and 1983 (sample sizes in parentheses).

Age	March 1982	March 1983
2	8 (13)	0 (15)
3	75 (4)	60 (10)
4	75 (8)	57 (23)
>4	94 (47)	83 (46)

[a]Age at next birthday based on degree of tooth wear.